NASA Glenn Safety Manual

CHAPTER 30 - ERGONOMICS

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30.1 SCOPE

This section sets forth the Glenn Research Center ergonomics policy and assigns responsibilities for implementation and enforcement.

30.2 APPLICABILITY

This policy is applicable to the Cleveland and Plum Brook facilities, and any other facilities under the Glenn Research Center cognizance.

30.3 MISSION STATEMENT

It is the policy of the Glenn Research Center to manage and conduct its research and development operations in such a manner as to eliminate or minimize all potential hazards and to avoid accidents involving injury to personnel, damage to property, or loss of research operation time and effectiveness. The ergonomics policy is designed to minimize work-related musculoskeletal disorders by developing a proactive ergonomic program. Such a program will assure high productivity, minimize illness and injury risks and increase satisfaction among the workforce.

30.4 POLICY

The Glenn Research Center (GRC) is committed to incorporating the ergonomics program into the Center's goals of maintaining and preserving a safe and healthy work environment for all employees. To achieve and maintain this safe working environment, the cooperation of every member of the Glenn staff is essential. Glenn will provide the proper equipment, facilities, safety rules and procedures necessary for ergonomically safe working conditions. The staff is responsible for using the equipment and facilities in a safe, approved manner, thereby contributing to an effective ergonomics program

30.5 RESPONSIBILITIES

Management Commitment and employee involvement are complementary and essential elements of a sound safety and health program. Commitment by management provides the organizational resources and motivating force necessary to deal effectively with ergonomic hazards.

30.5.1 Management Commitment to Ergonomic Safety

- It is the role of management to implement each element of the ergonomics policy and program to resolve and control ergonomic problems. The goal is to institute a proactive approach that anticipates and prevents such problems.

- Management will commit resources to training the workforce to be more aware of ergonomic risk factors for Work-Related Musculosketal Disorders (WMSDs).
- Management is also responsible for meeting with employees and supervisors to allow a full discussion of the policy and the plans for implementation.
- Management must also supply all those involved in or affected by the ergonomic activities with information regarding any changes. The results of the ergonomic efforts should be publicized, emphasizing both the notable accomplishments and the plans for improvement as well as emphasizing the program's importance.
- Support purchase of equipment when necessary or possible.

30.5.2 Supervisors

- Complying with the Ergonomics Program.
- Be familiar with the Program requirements and ensure their employees comply with them.
- Support the Program as it relates to the needs of their employees.
- Support the Ergonomics Team in identifying ergonomic concerns and notifying them.
- Work with the Safety Office to fix ergonomic problems and concerns.

30.5.3 Employees

- Learning the signs and symptoms of Musculosketal Disorders (MSDs) and reporting any that you have to your supervisor.
- Practicing good posture and work habits to reduce ergonomic injury.
- Bringing your ergonomic concerns to management.
- Serving on a safety and health committee that makes recommendations to correct ergonomic hazards.
- Serving on an ergonomic team; learning and using skills to identify and analyze jobs for ergonomic hazards and making recommendations to correct them.
- Practicing good ergonomics off the job

30.5.4 Glenn Safety Office (GSO)

- Provides guidance on the requirements of Federal, State, and Local ergonomic regulations as well as standard ergonomic guidelines.
- Maintaining the Ergonomic Program.
- Responsible organization for all original Ergonomic Analysis Reports will be kept on file.

30.5.5 Ergonomic Assessment Team

- Is composed of members from safety, environmental, medical services, fitness center and manufacturing laboratories.
- Trained in recognizing, evaluating, and controlling ergonomic hazards that may be present at GRC.
- Performs an assessment of an employee's work area, based on requests.
- Submits an ergonomic survey to the employee. The survey examines the most critical ergonomic components of the employees' environment.
- Conducts an interview, takes anthropometric and workstation measurements.
- Analyzes the results of the ergonomic assessment to determine if WSMDs issues exist at GRC, and if so, to what degree. Using this analysis, team members will determine the effort level to be used to eliminate or minimize the problems.
- Investigate OSHA Form 300 logs, worker compensation claims, references from medical services, and job tasks, which involve ergonomic risk factors as, defined by National Institute for Occupation Safety & Health (NIOSH).

30.6 WHAT ARE WORK-RELATED MUSCULOSKELETAL DISORDERS (WMSDs)?

Work-Related Musculoskeletal Disorders (WMSDs) or referred to as musculoskeletal disorders describes the following:

- Disorders of the muscles, nerves, tendons, ligaments, joints, cartilage, or spinal discs.
- Disorders that are not typically the result of any instantaneous or acute event (such as a slip, trip, or fall) but reflect a more gradual or chronic development.
- Disorders diagnosed by a medical history, physical examination, or other medical tests that can range in severity from mild and intermittent to debilitating and chronic.
- Disorders with several distinct features (such as carpal tunnel syndrome) as well as disorders defined primarily by the location of the pain (i.e., low back pain.)

30.6.1 The term "WMSDs refers to:

- Musculoskeletal disorders to which the work environment and the performance of work contribute significantly, or
- Musculoskeletal disorders that are made worse or longer lasting by work conditions.

30.6.2 Why are WMSDs a Problem?

- WMSDs are among the most prevalent lost time injuries and illnesses in almost every industry.

- WMSDs, specifically those involving the back, are among the most costly occupational problems.
- Job activities that may cause WMSDs span diverse workplaces and job operations.

30.6.3 What is Ergonomics?

- Ergonomics is the scientific study of human work.
- Ergonomics considers the physical and mental capabilities and limits of the worker as he or she interacts with tools, equipment, work methods, tasks, and the working environment.
- A goal of ergonomics is to reduce MSDs by adapting the work to fit the person, instead of forcing the person to adapt to the work.

30.7 GLENN'S ERGONOMIC PROGRAM

The Ergonomic program here at Glenn takes a proactive approach to workplace ergonomics. Proactive ergonomics emphasize efforts at the design stage or work processes to recognize needs for avoiding risk factors that can lead to musculoskeletal problems (in effect, to design operations that ensure proper selection and use of tools, job methods, workstation layouts, and materials that impose no undue stress and strain on the worker).

There are six key program elements to help eliminate ergonomic injuries. Those program elements are:

- Management leadership and employee involvement,
- Ergonomic hazard identification and information programs,
- Job hazard analysis and control,
- Training programs,
- Medical management of emerging injuries, and
- Program evaluation

30.7.1 Ergonomic Assessment Process

- Request an ergonomic assessment.
- Team member sends employee an ergonomic survey. This allows the team to capture quantifiable ergonomic data, job information, and operator comments. The evaluation helps to identify areas where ergonomic risk factors are present and any ergonomic concerns.
- Employee fills out form and returns it to the team member. The team member will not schedule an assessment until the survey has been completed.
- Team member reviews submitted information and makes an appointment with employee to perform ergonomic assessment, which includes interviewing, taking anthropometric and workstation measurements.

- Then the ergonomic team member completes an Ergonomic Analysis Report and sends a copy to the employee and his/her supervisor. It is up to the employee to discuss the results of the ergonomic assessment with their supervisor.

30.7.2 Ergonomic Awareness Training

The objective of the ergonomics awareness training is to provide employees, managers and supervisors with the knowledge and skills necessary to:

- Recognize workplace risk factors for musculoskeletal disorders and understand general methods for controlling them.
- Identify the signs and symptoms of musculoskeletal disorders that may result from exposure to such risk factors and be familiar with the company's health care procedures.
- Know the process used to address and control risk factors, the employee's role in the process, and ways employees can actively participate.
- Know the procedures for reporting risk factors and musculoskeletal disorders, including the names of designated persons who should receive the reports.

30.8 ACCIDENT PREVENTION

30.8.1 Trends Analysis/Records Review

Worksite analysis begins with reviewing records to identify patterns of injuries (or potential injuries) to help find the jobs and workstations that may have musculoskeletal hazards.

30.8.2 When Should You Do a Trend Analysis/Records Review?

The ergonomic team lead will perform a trend analysis every six months to measure progress and to see if new problem areas have developed. The record review may be done on a yearly basis whenever:

- The workplace moves to a different location
- Workstation configurations change
- The company purchases new equipment
- Work methods or procedures change

The periodic analysis/reviews will help keep our ergonomics program focused and give a way to measure success. The records available for review will depend on the record-keeping requirements here at GRC. Refer to Chapter 21 "Mishap Reporting and Accident Investigation" Some of these records contain confidential information. The team members will maintain confidentiality. They may also need to remove employee's names and other identifying information from certain records to comply with the law.

30.8.3 Identifying Risk Factors

Once the records are reviewed and completed, the team members will have a short list of jobs that they want to investigate further. The first step in identifying risk factors is to study the jobs that were chosen to identify the risk factors present. The following list of common risk factor types can serve as a general guide in this process.

- Repetition – e.g., repeating the same motions every few seconds for more than 2 hours continuously or using a device (such as a keyboard and/or mouse) steadily for more than 4 hours daily.
- Force – e.g., lifting more than 75 pounds at any one time, or pushing/pulling with more than 20 pounds of initial force (such as pushing a 65 pound box across at tile floor for more than two hours per day).
- Awkward postures – e.g., repeatedly raising or working with the hands above the head for more than two hours a day, or working with the back neck or wrists bent for more than two hours total per day.
- Contact Stress – e.g., using forceful body contract more than ten times an hour for more than two hours total per day.
- Vibration – e.g., using tools or equipment that typically have high vibration levels (such as chainsaws, jack hammers, percussive tools) for more than 30 minutes per day or tools with moderate vibration levels (such as jig saws, grinders, etc.) for more than two hours per day.
- Static loading or sustained exertion - The physical effort or body postures that are held and require muscle contraction for more that a short time. As muscles remain contracted, the blood flow to the muscles is reduced.
- Extreme temperatures - Low temperatures reduce sensory feedback, dexterity, blood flow, muscle strength, and balance. High temperatures increase the rate at which the body fatigues.
- Poorly fitted gloves - Reduce dexterity and feeling, resulting in a need to use stronger muscle force.

30.8.4 Incidence and Severity Rates

The team will look at the gathered data and group together similar injury types, body parts, severity of injuries, etc. They will help find the areas that produce the greatest number of, or the most costly, injuries and illnesses.

30.9 COMPUTER WORKSTATIONS

Computer workstations have special considerations. The monitor and keyboard positions, lighting and seating are especially important in preventing work-related musculoskeletal disorders and eye discomfort. Shared workstations should be easily adjustable so the screen and keyboard can be at the proper level. These aspects should be taken into account to prevent discomfort and/or injury:

- Neutral posture at the keyboard and mouse-arms comfortably at the sides, elbows bent at approximately 90 degrees, forearms parallel to the floor, knees slightly below hips, and wrists straight
- Chairs should:
    - Adequately support the back and legs.
    - Have padded seats.
    - Separately adjustable back and seat cushions.
    - Permit feet to be supported either on the floor or with a footrest.
    - Be easily adjustable while seated, have swivel seats for most tasks.
    - Isolate workers from whole-body vibration
    - Have an adjustable arm support when appropriate
- Work surface should be large enough to support the keyboard, mouse, monitor and documents.
- The top line of the screen should be even with the top of the forehead to keep the neck straight. Screens that tilt vertically and swivel horizontally help the worker adjust the best viewing angle
- Monitors should be placed 18-30 inches away from worker for viewing
- Keyboards and monitors should be detachable so the angle and position can be adjusted
- Documents should be at the same height and distance as the screen
- The screen and document should be easily viewed so that the worker's head isn't turned to the side of tilted up or down regularly
- To prevent glare, the monitor and keyboard should be perpendicular to windows and between (not directly under overhead lights)
- Screen contrast and brightness should be easily adjustable
- Screen characters should be clearly displayed, neither wavy nor flickering
- Wrist/palm rests may be used to protect wrists and palms from hard or sharp edges and to help keep the wrists in a neutral position. However, resting wrists on a wrist/palm rest during keying can put pressure on nerves. Wrist/palm rests should be made of soft but supporting material and be the same height as the front edge of the keyboard.

30.10 MATERIAL HANDLING/MOVEMENT

Lifting, carrying, pushing or pulling objects can strain the back, arms and shoulders. Strength and lifting limits should not be exceeded; extreme muscular exertion can cause injury. The following steps will make materials handling/movement easier:

- Do not exceed the physical ability of the worker doing the lifting.
- Provide adequate recovery time for tasks that require frequent lifting.
- Provide easy access so the load is in front of the person lifting.
- Eliminate twisting by changing the start or end point of the lift.
- Put items to be lifted between knee and shoulder height.

- Provide handles or cutouts to make grasping easier, permit a closer lift, and allow items to be carried near the body.
- Change an object's shape to make it easier to grasp.
- Decrease the weight of objects.
- Decrease the distance or height over which the object must be moved.
- Distribute a load evenly within a container.
- Use hand carts or hand trucks.
- Use a vacuum-assisted hoist or integrated conveyors.
- Use loaders, cranes and motorized material pallets to help move loads that are larger or heavier than one or two people can safely handle.

30.10.1 NIOSH Work Practices Guide for Manual Lifting

The National Institute for Occupational Safety and Health (NIOSH) is the Federal agency responsible for conducting research and making recommendations for the prevention of work-related disease and injury. The Institute is part of the Centers for Disease Control and Prevention (CDC).

NIOSH has developed the Work Practices Guide for manual lifting to help you determine which risk factors are problems. The NIOSH lifting guidelines consist of a formula to find the Recommended Weight Limit (RWL) for a lifting job. Although the formula is complex, you only need a tape measure and a stopwatch to gather the necessary data.

Lifting tasks are one of the main contributors to work-related musculoskeletal disorders. Some of the many potential risk factors associated with lifts include excessive force, awkward postures, repetitiveness, and static loading.

30.10.2 Static or Awkward Postures

Prolonged static or awkward postures can rapidly cause fatigue. Work should be done so neutral postures are maintained, stoops and reaches are avoided, and time working overhead is minimized. For example, tasks should be organized so those workers at a conveyor belt don't have to lean over the belt.

30.10.3 Mechanical Stress

Nerves, tendons and blood vessels can be damaged by exposure to hard or sharp edges, such as a table edge. Equipment should be moved so a worker doesn't touch the edge, or edges should be padded to minimize contact. For example, in packing boxes, the position of the box could be changed so a worker doesn't have to contact a sharp edge to place the contents.

30.10. 4 Repetitive-Motion Tasks

Tasks involving repetitive motion are major contributors to cumulative-trauma disorders. You can minimize repetition by:

- Using automation, such as in stapling, sorting, labeling or filling operations.
- Changing the job to include the tasks that don't use the same muscle groups.

30.10.5 Excessive Force

Workers must use excessive force when objects are difficult to grasp or control, equipment and tools are poorly maintained, or tasks require awkward postures. You can eliminate the use of excessive force by:

- Improving friction on slippery objects.
- Using mechanically assisted devices for awkward lifts.
- Choosing tools that better fit the hand.
- Keeping equipment properly maintained to prevent jamming and sticking.
- Providing adequate workroom to perform tasks.

30.10.6 Tool and Equipment Design

Tools and equipment should fit the individual user and be chosen for the specific demands of the task. Tools should be designed to maintain neutral body positions. Take extra care to avoid twisting, vibration, static muscle loading, and pressure on tissues and joints. Factors that can be modified to prevent risks include tool size, weight, and balance, handle size and position, and power control design.

30.11 GENERAL RECOMMENDATIONS FOR MUSCULOSKELETAL HEALTH

It is important to note that simply having the proper workstation setup is not enough. The workstation equipment must be used as intended and in a sensible manner. Sensible use of the computer workstation includes taking breaks to get up and stretch, frequently focusing the eyes on objects farther away than the monitor screen, and exercising regularly to maintain sufficient upper body strength and mobility. Such exercise does not have to be strenuous; walking is a great way to keep up aerobic capacity, and simple lifts with light arm weights can help maintain sufficient upper extremity strength. If this is not already a part of your personal fitness routine, call the Glenn Fitness Center (extension 3-6313) for more information on the types of physical activities that will be beneficial.

30.11.1 What to Do if You are Experiencing Recurrent, Problematic Symptoms:

If any individual feels that he or she has developed recurrent musculoskeletal symptoms, which are interfering with the normal use of a computer workstation, such as numbness,

tingling, or pain in any area, that person should contact Medical Services or his/her personal physician for an assessment of the problem. There are many causes of musculoskeletal symptoms, and it is important to obtain a correct diagnosis of the problem in order to determine the best treatment. Some common causes of musculoskeletal disorders include previous injuries, sports activities, and some inherited conditions.

30.11.2 If You Still Have Questions or Concerns:

While every attempt has been made to offer general guidelines that will be beneficial to a majority of the population, many individuals have special needs or preferences that may not have been adequately addressed in this chapter.

The NASA Glenn's Ergonomic Assessment Team consists of ergonomics specialist from safety; environmental, medical, manufacturing/research, and fitness teams can assess and make recommendations for a more healthy/ergonomic workstation. Studies show that simple adjustments to the workstation can help to increase productivity and decrease illnesses and injuries (i.e., carpal tunnel syndrome and lower back pain.) Those who feel they need extra assistance or individual guidance in setting up their computer workstations are encouraged to call the Safety Office (extension 3-6735) for an ergonomic assessment.

30.12 DOCUMENTATION

Ergonomic Log: This log is setup internally for the Ergonomic Team members to access. It will let us know the Case No., Date of Problem/Complaint Received, if it was a Request/Problem, Evaluator's Name, Employee Name and Location, Date and Type of Assessment performed and when the findings report was sent.

Ergonomic Survey:
Pre-assessment - given to the employee before assessment to determine any risk factors up front.
Post-assessment - given to the employee after 5 months to identify change in status and implementation of controls.

Ergonomic Analysis Report: A copy of the report is given to the employee and to his/her supervisor after an Ergonomic Assessment has been completed. The report includes who, what, where, why, methods, results, recommendations, current status and challenges.

30.13 REFERENCES

- National Institute for Occupational Safety and Health (NIOSH) Web site http://www.cdc.gov/niosh/ergopage.html - Ergonomics and Musculoskeletal Disorders.
- U.S. Department of Labor, Occupational Safety Health Administration (OSHA) Web site (http://www.osha.gov/ergonomics/index.html) - Effective Ergonomics: Strategy for Success.
- "Ergonomics Program Management Guidelines for Meatpacking Plants," U.S. Department of Labor, OSHA, 1990.
- Technical Report, Work Practices Guide for Manual Lifting," National Institute for Occupational Safety and Health (NIOSH) Pub. #81-122, DHHS, March 1981.
- Revisions in NIOSH Guide to Manual Lifting, Puts-Anderson, V. & T. Waters, University of Michigan, Ann Arbor, Michigan, April 1991.
- Cumulative Trauma Disorders, Edited by Vern Putz-Anderson.
- American National Standards Institute (ANSI) Standard on Control of Work-Related Musculoskeletal Disorders.
- ANSI/HFS 100-1988, "American National Standard For Human Factors Engineering Of Visual Display Terminal Workstations".

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